Supporting Information for

Observation of gate-tunable coherent perfect absorption of terahertz radiation in graphene

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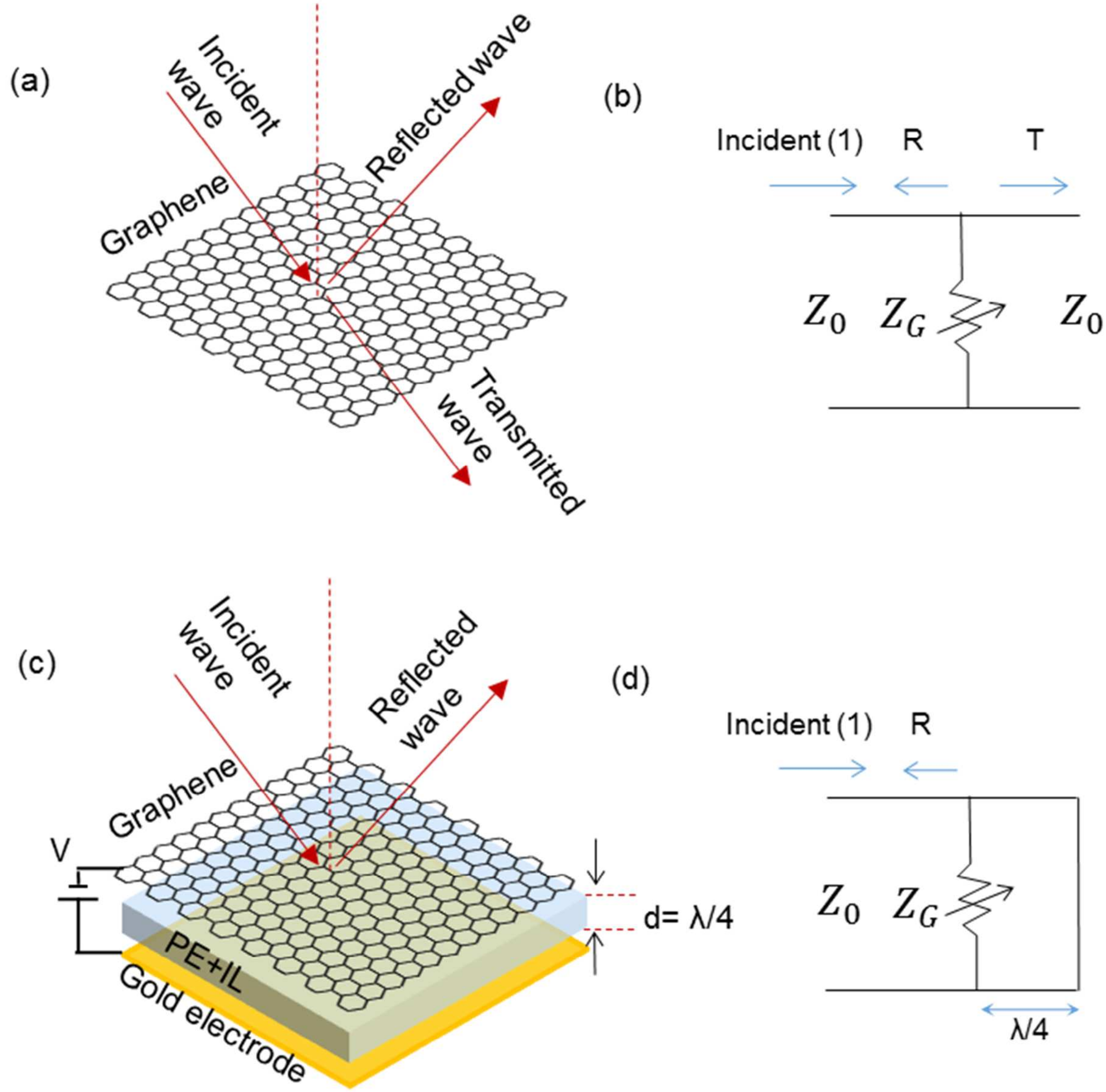

Figure S1: Schematic drawing of free standing graphene and active THz surface and their transmission line models. In the case of free standing graphene, the maximum absorbance is achieved when the surface impedance of graphene (Z_G) matches the half of the free space impedance (Z_0). For the device, metallic reflecting surface is modeled as a short circuit at a quarter wave distance from the graphene. The quarter wave transmission line converts the short circuit in to an open circuit. In this case, the maximum absorbance is achieved when the surface impedance of graphene is Z_0. Here the surface impedance of graphene refers impedance due to optical conductivity.

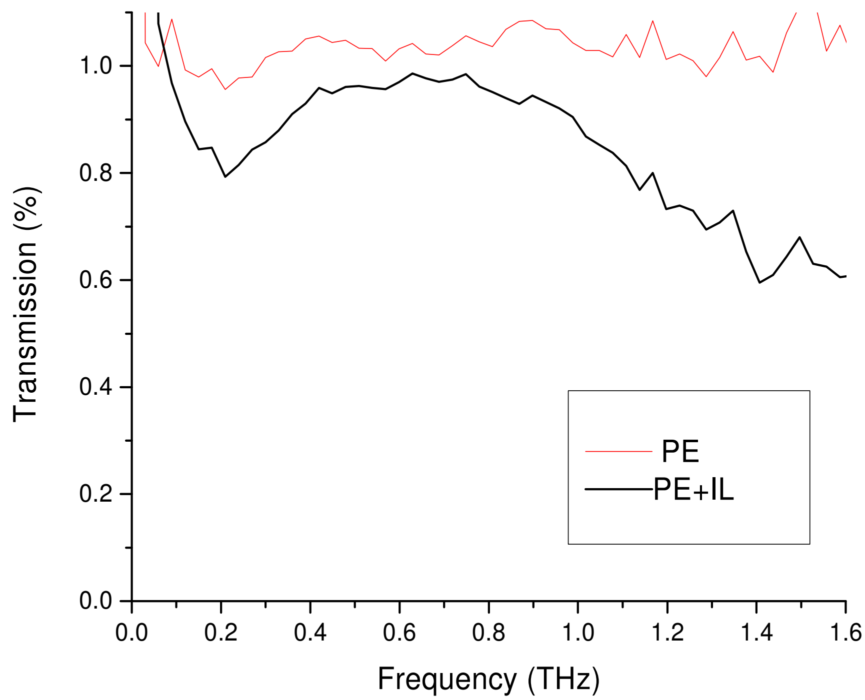

Figure S2. THz transmission of PE membrane and PE membrane with ionic liquid.

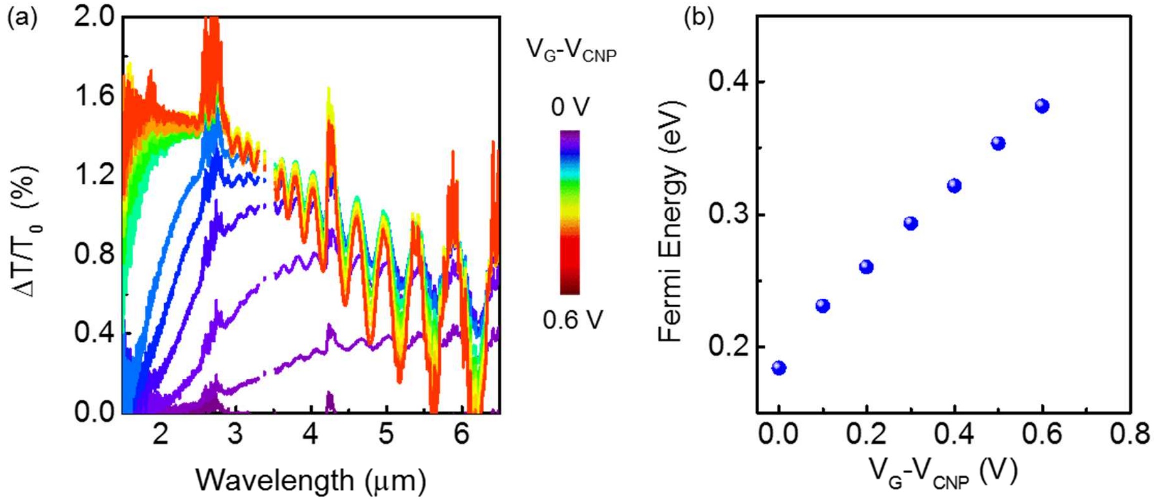

Figure 34. (a) IR reflectivity of the active THz surface and (b) the extracted Fermi energies at low bias voltages.

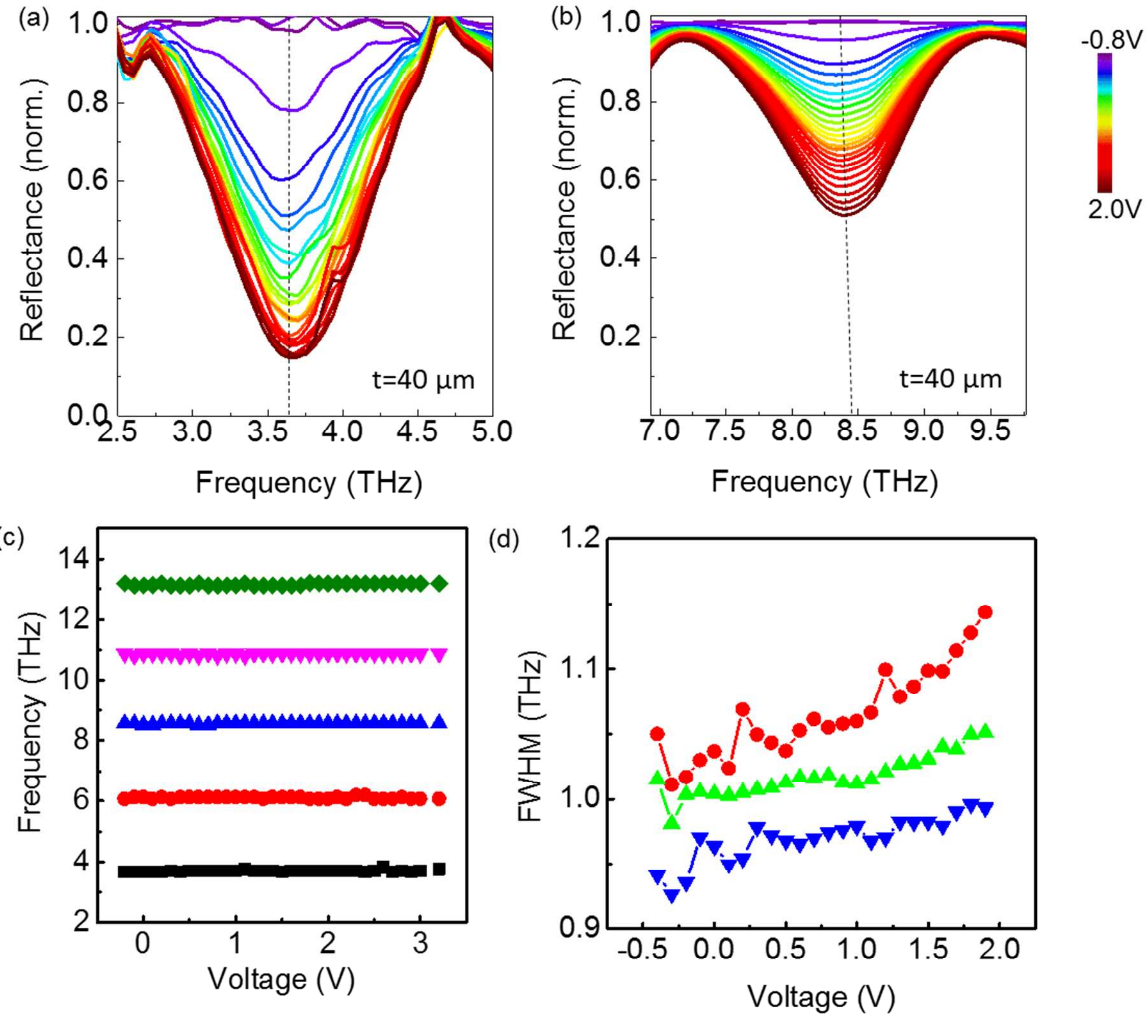

Figure S4. (a,b) The reflectivity spectra of individual resonances at 3,6 and 8.5 THz at different gate voltages. (c) Variation of the resonance frequency and the FWHM of the resonances. We do not observe a significant shift in the resonance frequency however, the FWHM increases slightly with the bias voltage.

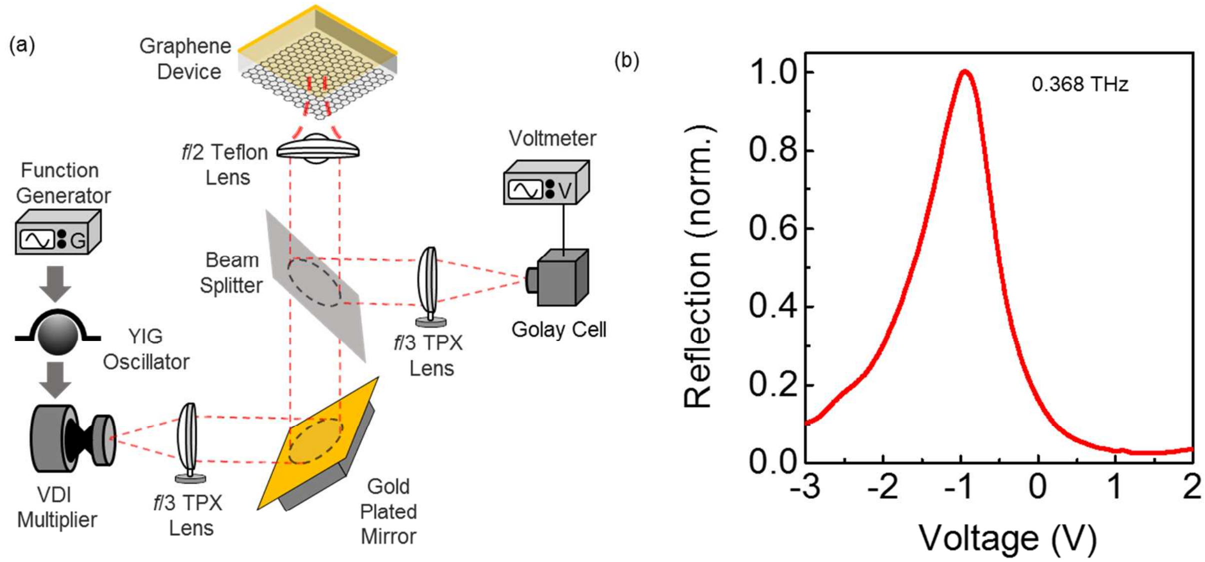

Figure S5: (a) Schematic drawing of the experimental setup used for reflectivity measurements at 0.368 THz. A Virginia Diode, Inc. Schottky diode (VDI), based, multiplied mm-wave/THz emitter is used as a tunable frequency signal source (WR9.0AMC+WR2.8X3). Driven by a voltage-controlled frequency-tunable YIG oscillator, the system can provide a minimum average output power of about 1 mW. The output of the source is amplitude modulated via function generator in order to detect the radiation with a Golay Cell (Tydex TC-1T). (b) The normalized reflectivity plotted as a function of bias voltage. We obtained a modulation of 98% at 0.368 THz.